

## **Laser Hygrometer Radiosondes for CR-AVE/Ticosonde 2006**

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A new type of balloon-borne radiosonde designed to make measurements of water vapor in the driest region of the atmosphere was flown during the Ticosonde component of the January-February 2006 NASA CR-AVE mission out of San Jose, Costa Rica. The radiosondes use a tunable diode laser operating near 1369 nm to measure water vapor in an open optical path (145.7 cm long) as the 1.14 kg payload is carried to altitudes as high as 30 km by a 1000 g helium-filled balloon. Measurement range of the laser hygrometer radiosondes is nominally 0 - 5000 parts per million by volume (ppmv) of H<sub>2</sub>O at atmospheric pressures in the 500 to 20 mbar pressure range (approximately 6 - 26 km). They are specially designed to provide data in the tropopause region where water vapor concentrations can approach levels as low as 1-2 ppmv. Data is transmitted to a ground station via a radio-frequency (400-406 MHz) link and collected using a portable, inexpensive ground station.

The laser hygrometer radiosonde measurements are complementary to frost point hygrometer radiosonde measurements which use a chilled mirror technique to directly measure dew or frost point, and to conventional inexpensive radiosondes (Vaisala) which measure relative humidity at the higher water vapor levels present at lower altitudes. All three types of water vapor measurement devices were flown during the CR-AVE/Ticosonde 2006 mission to provide coverage from ground level to high altitudes using different measurement techniques. The radiosonde data will provide vertical profiles of water vapor over the San Jose, Costa Rica area at higher altitudes than the WB57 aircraft can reach, and provide useful data for validation of satellite measurements which "look down" to obtain vertical profiles of water vapor at overpass times coincident with the balloon launches.